
**Mechanical vibration — Measurement of
vibration on ships —**

Part 4:

**Measurement and evaluation of vibration
of the ship propulsion machinery**

Vibrations mécaniques — Mesurage des vibrations à bord des navires —

*Partie 4: Mesurage et évaluation des vibrations des machines de
propulsion des navires*



This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Vibration tests	3
4.1 Instrumentation	3
4.2 Test conditions	3
4.3 Test procedure	4
4.4 Data processing	5
4.5 Measurements	5
5 Evaluation criteria	14
6 Test report	15
Annex A (informative) Manoeuvring, transient measurements	16
Annex B (informative) Evaluation of vibration at mechanical azimuth drives (e.g. Schottel rudder propellers) and shaft lines by measurements on non-rotating parts	17
Annex C (informative) Evaluation of the vibration of a Voith–Schneider propeller by measurements on non-rotating parts	18
Bibliography	20

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 20283-4 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 2, *Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures*.

ISO 20283 consists of the following parts, under the general title *Mechanical vibration — Measurement of vibration on ships*:

- *Part 2: Measurement of structural vibration*
- *Part 3: Pre-installation vibration measurement of shipboard equipment*
- *Part 4: Measurement and evaluation of vibration of the ship propulsion machinery*

The following part is planned:

- *Part 1: General guidelines*

Introduction

In general, classification societies ask for a numerical study on the torsional vibration behaviour of the propulsion system for seagoing vessels at the design stage as a base for the design approval. Depending on the results of this study and the kind of plant to be considered, further torsional vibration investigations for verification on a case-by-case study may be required. Explicit criteria for the evaluation of the torsional loadings are given within the rules of the international classification societies as well as in the form of unified requirements (UR) of the International Association of Classification Societies, specifically IACS UR M68,^[10] with focus on the torque transmitting parts, such as shafts, gears, couplings, and connections. Studies of the bending vibration behaviour of the shaft as well as axial vibration of the propulsion system or crankshaft may be required by the classification societies in the exceptional case that the special design of the system makes such additional investigations necessary.

Propulsion systems may be exposed to vibration of high magnitude in general excited by the engine and/or propeller. In addition to the numerical criteria for evaluation of torsional vibration, some further special requirements may be raised, such as avoiding load reversal in the transmission train. In general, mechanical components may be perfectly designed for load reversal operation; however, some specific requirements in this direction are also based on smooth operation of the plant, and the owners or managers of special vessels such as navy ships or yachts consequently raise them.

The user of this part of ISO 20283 should bear in mind that for the evaluation of measured data on propulsion plants of ships the rules of the responsible classification society for the vessel in their latest edition or the valid IACS UR should be considered.

Should any issues regarding this part of ISO 20283 be directly or indirectly addressed by the contracted classification society's rules or other international binding regulations, such as those of the International Maritime Organization (IMO), the International Convention for the Safety of Life at Sea, and UK Maritime and Coastguard Agency, the choice of the measuring method applied should fulfil the sense of these rules or regulations, independently of whether the special measuring method is specified within this part of ISO 20283.

Mechanical vibration — Measurement of vibration on ships —

Part 4:

Measurement and evaluation of vibration of the ship propulsion machinery

1 Scope

This part of ISO 20283 provides guidelines for the instrumentation, measurement, and data processing procedures required to obtain reliable vibration data on ship propulsion systems. It also gives guidelines for the application of specific measuring techniques, which are common and adequate for measuring the mechanical vibration on propulsion plants of seagoing and inland vessels. The measuring techniques can be applied to diesel engine as well as turbine or electrically driven plants, always considering the specific limitation of application of each individually described procedure.

The procedures specified in this part of ISO 20283 focus on repetitive mechanical vibration (steady-state or quasi-stationary like a sweep) and can therefore be inadequate for measuring and evaluating transient, very fast-changing or shock signals.

This part of ISO 20283 mainly specifies techniques for measuring the mechanical vibration of the main propulsion plant during sea trials. The same or similar measuring principles can also be used for other purposes, such as performance monitoring, investigations of abnormal vibration in service, and evaluation of the condition of repaired parts. However, in such cases, the measuring procedure needs to be adapted to the specific requirements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2041:2009, *Mechanical vibration, shock and condition monitoring — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041 and the following apply.

3.1

free route

condition achieved when the ship is proceeding at a constant speed and course with helm adjustment of $\pm 2^\circ$ or less and no throttle adjustment

[SOURCE: ISO 20283-2:2008, 3.3]

3.2

vibration severity

value, or set of value, such as maximum value, average or r.m.s. value, or other parameters that are descriptive of the vibration, referring to instantaneous values or to average values

[SOURCE: ISO 2041:2009, 2.51]

Note 1 to entry: The vibration severity is a generic term, which in the past has been used in relation to vibration velocity. However, it is now more generally used as descriptive of other measurement units, such as displacement and acceleration.